

## **Note of SAFESPUR Meeting**

### **Nuclear Decommissioning: where we are, priorities and challenges**

**AMEC, Warrington, 12 January 2011**

This meeting was chaired by Peter Booth, who is a senior technologist at the National Nuclear Laboratory (NNL). It included four presentations: one from the Nuclear Decommissioning Authority (NDA), one from the universities' DIAMOND consortium and two from AMEC. There were Q&A opportunities after each presentation. In the afternoon there was a tour of the AMEC Analytical Services laboratory complex.

#### ***NDA Decommissioning Priorities and Supply Chain Update***

This first presentation was by Samantha Dancy, who is a supply chain manager at NDA. She began by noting that the NDA settlement from the Government's Comprehensive Spending Review was about £3 billion per year for the next three years. NDA considers this to be a good settlement, which demonstrates the Government's commitment to decommissioning.

Samantha went on to summarise the main features of NDA's forthcoming Strategy, which is being finalised following public consultation and is planned to be issued on 21 March 2011. In the Strategy, NDA's work is described under six themes. The Site Restoration theme is the backbone of the Strategy. NDA prioritises its work based on risks to people and the environment. When allocating resources, it recognises that there may be a need to "spend to save" in some areas.

The NDA's draft Business Plan for 2011-14 was out for consultation at the time of the meeting. The Plan is designed to begin to implement the forthcoming Strategy. It embodies a "delivery through others" approach, in which NDA focuses on strategic decisions and ensuring that its Site Licence Companies (SLCs) do the necessary work. Site Strategic Specifications are being developed for each site; these set out what is to be achieved but are not prescriptive about the means of achieving it. SLCs are also being given higher sanction levels. Some decommissioning work is being deferred in order to address priorities. Overheads are being reduced within NDA and across its estate.

A significant fraction of NDA's budget will continue to be spent at Sellafield. Reducing risks and hazards at the Legacy Ponds and Silos is a key priority for the site. The Magnox sites are implementing a "lead site" approach, in which Trawsfynydd and Bradwell are planned to enter care and maintenance (C&M) earlier than was previously expected, Chapelcross and Dungeness A will follow and there will be a slowdown in work at Hinkley Point A, Sizewell A and Hunterston A. The four steps to early C&M are:

- decontaminating ponds, sealing them and removing the structures or capping them
- treating fuel element debris (FED), decontaminating the vaults that held the FED and removing or capping them
- retrieving ion exchange resins, sludges and desiccants, and packaging them in Mini-Stores that are kept in a warehouse
- removing some buildings and structures, deplanting those that remain, placing the site in a passively safe state.

NDA is increasingly taking an estate-wide approach. It has established a Shared Services Alliance, which is made up of NDA, the procurement heads of the SLCs and NNL. Its Collaborative Procurement Programme is making good progress. There are multi-site

contracts in place that total about £600 million; these cover areas such as agency supplied workers, laboratory supplies, IT hardware and software, PPE, bulk and cylinder gases and package chemicals. Multi-site contracts with a value of about £1.1 billion are at the pre-contract stage; these include health physics, specialist nuclear services, bulk chemicals and facilities management.

Issues raised in Q&A included the following.

*NDA approach:* the comment was made that SLCs welcome the NDA's intention to take a more strategic approach but it would take time to bed down and involved a substantial culture change.

*Dialogue with regulators:* a participant commented that more dialogue is needed with regulators. In the current economic climate, there is a need to resist proposed regulatory requirements that would increase costs (e.g. further discharge reductions).

*R&D work:* there was a question about whether NDA would continue to fund R&D projects. The specifics of the NDA R&D budget were not known by Samantha, but R&D and technical underpinning continue to be important to the NDA. NDA R&D strategy is that where possible work is carried out by the SLCs in conjunction with their supply chain. Where necessary NDA will maintain a strategic directly funded R&D portfolio.

*Partnering with overseas organisations:* this question was whether NDA had any particular stance on whether, when bidding for contracts, UK organisations should partner with overseas organisations that had relevant experience. The answer was that the process is an open one (through the OJEU for larger contracts). When NDA had first been established, and before that, involvement of overseas organisations had been very valuable in introducing innovation. Recent competitions for SLCs had been won by consortia involving overseas companies but each consortium had been judged on its merits. The UK had an established decommissioning market, but it might be that overseas organisations had a role for niche requirements if they were not already operating in our market.

### ***In Situ Techniques for Characterisation of Legacy Waste Sludges***

This presentation was by Timothy Hunter of Leeds University. The work on *in situ* characterisation techniques is being carried out as part of the DIAMOND initiative (Decommissioning, Immobilisation And Management Of Nuclear wastes for Disposal). DIAMOND involves a consortium of six universities, led by Leeds, who are carrying out 35 research projects. Over 20 companies are playing an active part in DIAMOND by advising on projects, providing project supervision, loaning equipment or providing access to specialised facilities. DIAMOND has about £4 million funding over four years and involves about 50 academics, mostly PhDs.

The *in situ* characterisation work is to find alternatives to sampling, both for sludges in their current locations and during future processing and storage. Three techniques are being investigated:

- an ultrasonic Acoustic Backscatter System (ABS) to monitor particle settling and sedimentation
- the use of a Quartz Crystal Microbalance (QCM) to determine yield stress
- impinging jets to measure erosion.

The ABS uses dip probes and measures the raw attenuation of a scattered ultrasonic signal. The eventual aim is to determine particle concentration profiles as a function of time. Results

to date have shown that it is possible to locate cloud fronts and measure settling rates. It has been found that bulk concentrations within a column rise and then fall. This is thought to be the result of larger particles falling faster and producing upward movement of water that hinders the descent of smaller particles. As time goes on, the cloud front moves further down the column and there is less segregation of larger and smaller particles within it. The next step in the work is to carry out measurements in a larger tank rig.

The QCM technique involves using a dip probe and determining changes in oscillation frequency and resistance in the crystal, then correlating these with yield stress. The aim is to determine how difficult it will be to remove sludges from ponds, tanks etc. Sampling is not appropriate for this purpose because it involves disturbing the sludge. It has been found that changes in frequency and resistance track yield stress qualitatively. Future work will involve tests in other clay systems.

Issues raised in Q&A included the following.

*Convincing SLC staff to use new techniques:* the comment was made that many techniques had been tried in the past but there had been problems in persuading SLC staff to adopt them. Timothy replied that he expected the *in situ* techniques to find practical application. For example, the techniques could help when sludges are being pumped out of ponds, by showing where the sludge was “fluffy” and able to be pumped and where it was “set like concrete”. The techniques could also be applied in staged dewatering of sludges prior to cementation.

*Probe capabilities:* a question was asked about whether the probes could be fitted to remotely operated vehicles (ROVs) and how long the probes would last in practice. The reply was that the probes could be fitted to any piece of equipment, provided the cables could be kept free. Leeds University could not determine the lifetime of the probes because this required active conditions but Timothy noted that the probes were inexpensive. A key issue is the penetration depth of the probes, hence the planned work with larger rigs.

*Leak detection:* a participant asked whether these techniques could be used to detect leaks beneath the layers of sludge in a pond or other structure. The reply was perhaps. For example, it might be possible to detect density changes at the bottom of the sludge layer or to detect movement beneath it.

### ***Decommissioning Challenges***

This third presentation was by Derek Workman, Team Leader for Specialist Remediation Services at AMEC. He described several recent decommissioning projects, carried out by AMEC for various clients, in which it had been necessary to find innovative solutions.

#### ***Cell Wall Scabbling at Dounreay***

The cells in question had been used for post-irradiation examination of fuels and are highly contaminated. They are very narrow and have high walls, making it impossible to use large pieces of equipment. AMEC designed a scabbling head on a crab and arm system to remove 5mm of concrete from the cell walls remotely. The head has dry vacuum extraction and dust collection. At the time of the meeting the equipment had been built, tested extensively off-site and installed on site, and cell decontamination was about to begin.

#### ***Decommissioning PCM Magazines at the LLWR***

The plutonium contaminated material (PCM) has been removed from the magazines at the Low Level Waste Repository (LLWR). However, the magazines have both fixed and loose

contamination inside them, including on the ductwork and conduits. The interiors of the magazines are C5 areas, in which workers must wear pressurised suits. In addition, it is not possible to use robotics because the magazine floors are on several different levels. The AMEC solution is to use a frame-supported, hand-held scabbling machine. The scabbling device is close to the wall and the operator moves it around the frame; contaminated material is collected. In this way the C5 area can be progressively be reduced in size. The work was in progress at the time of the meeting. When complete it will be possible to access the magazines without respiratory protection and demolish them.

#### *Remediation of a Former VJ Battery Site at Eskmeals*

This site was used for testing depleted uranium shells. There were large quantities of equipment contaminated with depleted uranium, including one hundred one tonne concrete blocks and 100 tonnes of metals in 1-5 tonne pieces. The AMEC solution was to use three ventilated containments. One was for decontaminating large concrete items by removing the pieces that were contaminated. Another was for shot blasting metal objects. The third was for reducing the size of metal objects, by removing the contaminated parts. In all about 250 tonnes of waste were treated. Only 72 tonnes had to be disposed of to the LLWR. The remainder was recycled or disposed of as clean.

Derek was asked whether there had been resistance by clients to using novel approaches. His reply was no. In particular, at Dounreay the SLC had been willing to assess AMEC's rather different proposal on its merits.

#### ***Help from the Lab to Help You***

The fourth presentation of the meeting was by Linda Hilton, the Principal Programme Manager for the AMEC Analytical Services Laboratories. She described some lessons learned from experience that help to achieve faster turn round of samples, excellent quality analyses and lower costs to the client.

#### *Asbestos*

For reasons connected with insurance, AMEC's Analytical Services cannot change the physical form of any solid samples that contain asbestos (e.g. by breaking them up or grinding them down). It is therefore important that clients provide samples that have been broken down as much as possible on site. In one case the client organisation was able to use its own facilities to break down samples into smaller pieces; however the analysis at AMEC was delayed due to having to ship samples back for this to take place.

#### *Unusual Samples*

It is very helpful to AMEC Analytical Services if clients send a photograph of an unusual sample or send an inactive prototype sample. This enables the laboratory to work out in advance how to deal with a sample. It has the advantage of making it possible to clarify the client's requirements and to begin sample preparation as soon as the actual sample arrives at the laboratory.

#### *Tritium*

AMEC Analytical Services recommends sealing samples containing tritium in foil on site. This prevents loss of tritium and gives a better chance of good analytical results.

#### *Sample Size*

Sample size is linked to the Limit of Detection (LoD) because each radioanalytical method has been optimised for a sample size range to give the best LoD. Also, the higher the activity

concentration, the lower the sample size that AMEC Analytical Services can count. In addition, AMEC Analytical Services contracts out non-radiological analyses and its sub-contractors have sample size limits for some radioactive samples. It is therefore important for clients to discuss sample size with the laboratory at an early stage.

### *Activity Estimates*

Some clients are very cautious when estimating the activities of samples for transport purposes. This can lead to slower turn round times at the laboratory. AMEC Analytical Services uses activity estimates to plan the routes of samples through the laboratory and estimates that are too high will lead to routes that are slower than necessary.

Overall, it is better to involve the laboratory when planning a project, rather than waiting until the project is about to start. Early involvement not only saves time but also reduces analytical costs and improves the quality of results.

### **Chair's Summary**

Peter Booth thanked all the presenters. He summarised the main messages from the presentations as:

- the NDA budget is encouraging for contractors
- DIAMOND is a good example of needs-driven research
- innovation is important in meeting decommissioning challenges
- there are considerable advantages in involving analytical laboratories early in projects.

Peter then asked participants to feedback to CIRIA their ideas for topics and formats for future SAFESPUR meetings and visits. He gave some examples that had already occurred to the project team but emphasised that these had not yet been discussed with NDA or nuclear site licensees. The examples included:

- the new Exemption regime
- management of LLW (including VLLW)
- new build
- the NDA's Direct Research Portfolio
- data quality
- chartered status and accreditation
- reach back to overseas organisations (especially in the US and France)
- visits to Sellafield and Dounreay.

Lastly, Peter thanked AMEC for hosting the meeting and said that their continuing support for SAFESPUR was much appreciated.

Note prepared by Marion Hill

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